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V_c are located side by side in the same chromosomes not only at the time of the reduction division but also in all nuclear divisions and even perhaps that they remain in fairly close proximity in the more diffused chromatin of the resting nucleus. Then if homologous chromosomes or their chromatin masses are not closely associated in somatic cells, it would seem possible that whatever causes the change of a V_p factor into an S_p factor might at the same time affect the V_c factor of the same chromosome changing it into an S_c factor, while the V_p and V_c factors of the homologous chromosome remain unchanged.

It is of course recognized that a rather formidable number of hypotheses, with subsidiary assumptions, have been marshalled here to account for what may be very simple phenomena, but, if they do not do too great violence to the known facts of cytology, we are justifiable in accepting them tentatively as an attempt at a consistent interpretation of what otherwise seem inconsistent genetic facts.

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THE FOURTH INTERNATIONAL GENETICS CONFERENCE¹

IN a subject developing so rapidly as that of genetics, the delay of one and one half years in the publication of the results of an investigation is a serious matter. It is therefore to be regretted that the publication of the proceedings of the Fourth International Conference on Genetics has followed the common fault of international congresses in this respect. In many cases results which were new at the time of the conference have been anticipated by other work. In other cases the results of later experiments have no doubt served to modify opinions expressed at the conference. A portion of this delay is inherent in the nature of an international meeting. However, it is hoped that for the coming conference, steps will be taken to insure the more rapid publication of the proceedings.

The present volume of 570 pages consists of two parts. Part I (pages 1 to 79) contains the matter of historical interest relat-

¹“Comptes Rendus et Rapports de IV^e Conférence Internationale de Génétique.” Edités par Ph. de Vilморin. x + 571 pp. Masson et Cie, Paris. 1913.

ing to the conference. It includes the general organization; the list of members and adherents; an account of the various scientific and executive meetings and finally an account of the numerous receptions and excursions arranged for the entertainment of the members.

The membership of the conference totaled approximately 250, representing twenty different countries. Of these about 150 attended the conference. There were five sessions for the reading of papers and the transaction of business.

As the members registered each received an addressed envelope containing the program of the conference and printed slips giving in French a brief summary of each paper to be presented. In addition there were the invitations to the various receptions, excursions and entertainments, and finally an elegant bronze medal commemorative of the conference and bearing upon its reverse the name of the member. This medal, which was designed by R. Benard, bears on its face the likeness of Mendel. On the reverse in addition to the member's name is the artistic representation of pea flowers and pods and the inscription "*Rerum cognoscere causas.*" This elegant souvenir was provided through the generosity of M. Ph. de Vilmorin.

Of the many enjoyable excursions arranged for the conference, especial mention should be made of the day spent at Verrières-le-Buisson in visiting the experimental gardens of Vilmorin, Andrieux et Cie. An account of the more interesting cultures seen on this excursion is given on pages 44 to 56. At l'Institut Pasteur de Garches, in addition to the work of serum production, the members were shown the extensive plant for the breeding of guinea-pigs. In a visit to the Pasteur Institute at Paris the members were welcomed by Professor Metchnikoff and were enabled to see much of his work. During this trip Professor Blaringhem exhibited specimens and spoke of his work on traumatism with maize. The conference closed with a complimentary "Banquet de Clôture" at L'Hôtel Continental.

Any account of this conference would be incomplete without an appreciation of the royal entertainment given to the visiting members. For this the conference was chiefly indebted to the able secretary, M. Ph. de Vilmorin, to whose untiring efforts were due both the success and pleasure of the meeting.

Part II contains the fifty-eight scientific papers presented at the conference. These are printed either in French or English

and in each case there is a brief summary in the alternate language. This is a great convenience to the French and English reading public but it is not clear why German should have been so rigidly excluded. A number of the papers were presented in German but in each case these have been translated into French with an English summary.

Of the papers which attracted most attention at the conference probably that of Miss Saunders on "The Breeding of Double Flowers" held first place. Miss Saunders's results have since been published elsewhere but their interest is sufficient to be noted very briefly here. In the genus *Matthiola* there are two kinds of single flowers—(1) the double-throwing and (2) the non-double-throwing. The doubles are always sterile, so that doubles must always come from single parents. Miss Saunders showed that singleness is due to two factors, *X* and *Y*, and that in the non-double throwing type these two factors are linked together. Doubleness is due to the absence of either or both of these factors. Now it further appears that in the double-throwing strains all four possible combinations of these factors occur in the ovules but "the pollen appears unable to carry *X* and *Y* either alone or together." Thus we have in addition to the coupling or reduplication a case of sex-linked inheritance which so far as the writer is aware was the first case to be reported among plants.

In a brief paper Professors Bateson and Punnett pointed out that what they had formerly termed "coupling" and "repulsion" are in reality phases of the same phenomenon. In each case the results are produced by a "reduplication" of those gametes which represent the parental combinations. This is another case of results which were new at the time of the conference but which have become familiar to students of genetics through other publications.

A number of papers deal with the heredity and breeding of cereals. Of these there may be mentioned one by Dr. Jesenko upon a fertile hybrid between wheat and rye. This cross has been made a large number of times but in every instance the F_1 plants were sterile. Dr. Jesenko succeeded in finding one plant partially fertile and from this, F_2 and F_3 generations have been grown. The interest in this work lies in the fact that the F_2 and F_3 plants were fairly fertile. In this connection should be noted the paper by Mr. Sutton, of England, on hybrids between the wild pea of Palestine and the common commercial pea. In this species-

cross the F_1 plants were also nearly all sterile, but from a large number of crosses a few seeds were obtained and the F_3 and succeeding generations were quite fertile. A very similar result was reported by M. Bellair in the case of certain tobacco hybrids. It is possible that these investigations may point the way to a better understanding of sterility in species crosses.

The communication of M. Boeuf on the stability and variation of characters in pure strains of cereals points again to the conclusion that selection within a "pure line" is without effect. The author cites a large number of experiments to support his thesis.

The observations of Dr. Trabut upon the origin of cultivated oats will be of interest to students in this field.

Two papers deal strictly with the inheritance of quantitative characters, a subject of so much interest at the present time. Professor Bruce, of London, concludes that "It can not be affirmed with certainty that Mendelian laws apply to such characters." Professor Balls, of Egypt, presents a large amount of interesting data regarding quantitative characters in cotton hybrids. However, he believes the fluctuating variations are so large and due to so many causes that it is not possible to show that such characters are controlled by segregating factors. The rapid advance in this field of genetics within the past year would hardly support these conclusions.

An important paper by Nilsson-Ehle on Mendelism and acclimatization gives us a somewhat different view of acclimatization than that usually held. This author holds that increased resistance to cold, for example, is not obtained by the simple isolation of a more resistant type already present in a variety. Further such types do not arise by mutations in the ordinary sense of the word. He says in his summary (p. 156):

On the contrary, all my researches tend to show that the numerous types which can be distinguished, both in the characters of resistance to cold, precocity, and other quantitative characters, are produced by various combinations of certain Mendelian factors.

To those biologists who are still skeptical as to the validity of the factorial concept as a means of interpreting the facts of heredity we would recommend the paper by Professor von Tschermak. In experiments on the recrossing of hybrid peas which have extended over eight years and in which "some thousands of individuals have been recorded" he is able to "con-

firm the factorial theory in the most complete and satisfactory manner.''' In more recent papers he has given the details of these extensive experiments of which only a summary is presented in the above paper.

While the majority of the papers deal with plants there are several upon the animal side. Of these, there may be mentioned one by Walther on the coat color of horses. He considers that there are two principal colors in horses' coats, viz., yellow and red. These he says are allelomorphic to each other with yellow dominant. These colors may be modified by supplementary markings such as black marks, white hairs, etc. Thus such colors as brown, bay and dun would depend upon multiple factors.

Papers by Chappellier on duck hybrids, by Noorduyt on canaries and by Houwink on fowls contain points of interest.

Papers by Crouzon and by Drinkwater deal with phases of human inheritance.

Several papers by de Vilmorin and by Mrs. Haig-Thomas as well as those by Blaringhem, von Ruemker, Collins and Kempton, Johannsen, Hurst, Salaman, Swingle, and others contain many interesting points which it is not possible to mention in this brief account.

The volume is well printed on good paper and the numerous illustrations are well executed. A welcome feature of the volume is the reproduction of photographs of the participating members of the conference so far as these could be secured.

In general the editorial work is good. However, in spite of the fact that two proofs were submitted to the authors a considerable number of typographical and grammatical errors are to be found. This is particularly true in some of the English summaries (cf. for example p. 130). The services of an English editor would have made these much more readable.

The volume contains a wealth of observation which well repay reading. It will form a welcome addition to the library of students of heredity.

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